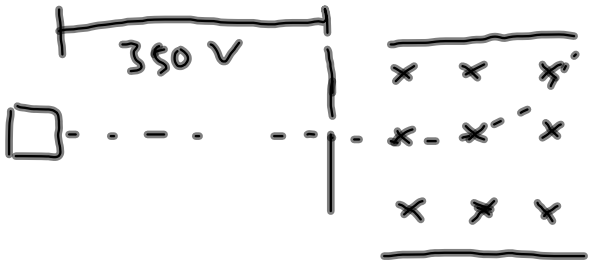
In an experiment designed to measure the magnitude of a uniform magnetic field, electrons are accelerated from rest through a potential difference of 350 V and then enter a uniform magnetic field that is perpendicular to the velocity vector of the electrons. The electrons travel along a curved path because of the magnetic force exerted on them and the radius of the path is measured to be 7.5 cm. What is the magnitude of the magnetic field?



$r = 7.5\ cm$

$\Delta V = 350\ V$

$q_e = -1.6E-19\ C$

$m_e = 9.11E-31\ kg$

$$\Delta K + \Delta U_e = 0$$

$$\frac{1}{2}m\left(v_f^2 - v_i^2\right) + q\Delta V = 0$$

$$v_f = \sqrt{\frac{-2q\Delta V}{m}}$$

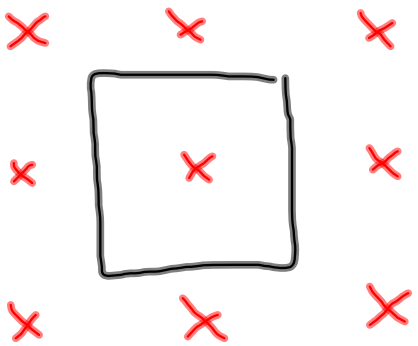
$$= 1.1E7\ m/s$$

$$r = \frac{mv}{qB}$$

$$B = \frac{mv}{qr}$$

$$= 8.4E-4\ T$$

A coil consists of 200 turns of wire. Each turn is a square of side d = 18 cm, and uniform magnetic field directed perpendicular to the plane of the coil is turned on. If the field changes linearly from 0 to 0.50 T in 0.80 s, what is the magnitude of the induced emf in the coil while the field is changing?



$$\mathcal{E} = \frac{\Delta}{\Delta t}\left(-NAB\cos\theta\right)$$

$$= -NA\cos\theta\ \frac{\Delta B}{\Delta t}$$

$$= -4.05\ \text{V}$$